CLAIMS

What is claimed is:

1. A method of producing a multiple cell battery, the method comprising:

winding a first battery cell a plurality of turns around a mandrel; and

winding a second battery cell a plurality of turns around the first battery cell.

2. The method as defined in claim 1 further comprising coupling the first and second battery cells in series.

3. The method as defined in claim 2 further comprising:

extending an anode layer of the first battery cell beyond an electrolyte layer of the first battery cell in a first axial direction;

extending a cathode layer of the first battery cell beyond the electrolyte layer of the first battery cell in a second axial direction;

extending an anode layer of the second battery cell beyond an electrolyte layer of the second battery cell in the second axial direction; and

extending a cathode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the first axial direction.

4. The method as defined in claim 3 further comprising electrically coupling the cathode layer of the first battery cell to the anode layer of the second battery cell.

5. The method as defined in claim 4 further comprising:

separating the first battery cell from the second battery cell by a layer of insulating material;

extending the insulating material in the first axial direction beyond the anode layers of the first battery cell;

coating axial ends of the multiple cell battery with conductive material;

removing a portion of the conductive material from an end in the first axial direction to electrically isolate the anode layer of the first battery cell from the cathode layer of the second battery cell.

6. The method as defined in claim 5 wherein removing a portion of the conductive material further comprises brushing away the conductive material until a portion covering the anode layer of the first battery cell is separated from a portion covering the cathode layer of the second battery cell by the insulating material.

7. The method as defined in claim 5 further comprising:

extending a portion of the anode layer of the first battery cell beyond the electrolyte layer of the first battery cell in the second axial direction, the portion of the anode layer beyond the electrolyte electrically isolated from the electrolyte layer;

extending a portion of the cathode layer of the first battery cell beyond the electrolyte layer of the first battery cell in the first axial direction, the portion of the anode layer beyond the electrolyte electrically isolated from the electrolyte layer;

extending a portion of the anode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the first axial direction, the portion of the anode layer beyond the electrolyte electrically isolated from the electrolyte layer; and

extending a portion of the cathode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the second axial direction, the portion of the cathode layer beyond the electrolyte electrically isolated from the electrolyte layer.

8. The method as defined in claim 5 further comprising:

refraining from extending the anode layer of the first battery cell beyond the electrolyte layer of the first battery cell in the second axial direction;

refraining from extending the cathode layer of the first battery cell beyond the electrolyte layer of the first battery cell in the first axial direction;

refraining from extending the anode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the first axial direction; and

refraining from extending the cathode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the second axial direction.

9. The method as defined in claim 1 further comprising coupling the first and second battery cells in parallel.

10. The method as defined in claim 9 further comprising:

extending an anode layer of the first battery cell beyond an electrolyte layer of the first cell in a first axial direction;

extending a cathode layer of the first battery cell beyond the electrolyte layer of the first battery cell in a second axial direction;

extending an anode layer of the second battery cell beyond an electrolyte layer of the second battery cell in the first axial direction; and

extending a cathode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the second axial direction.

11. The method as defined in claim 10 further comprising:

coupling the plurality of turns of the anode layer of the first battery cell to create a first terminal of the first battery cell;

coupling the plurality of turns of the cathode layer of the first battery cell to create a second terminal of the first battery cell;

coupling the plurality of turns of the anode layer of the second battery cell to create a first terminal of the second battery cell; and

coupling the plurality of turns of the cathode layer of the second battery cell to create a second terminal of the second battery cell.

12. The method as defined in claim 11 further comprising:

separating the first battery cell from the second battery cell by a layer of insulating material;

extending the insulating material in the first axial direction beyond the anode layers of the first and second battery cells;

extending the insulating layer in the second axial direction beyond the anode layers of the first and second battery cells;

coating ends of the multiple cell battery with conductive material; and

removing a portion of the conductive material from ends of the multiple cell battery in the first and second axial directions to electrically isolate the first battery cell from the second battery cell.

13. The method as defined in claim 12 wherein removing a portion of the conductive material from ends of the multiple cell battery in the first and second directions to electrically isolate the first battery cell from the second battery cell further comprises brushing away the conductive material from the end of the multiple battery cell until portions of the conductive material coupled to the anode layer of the first battery cell are electrically isolated from portions of the conductive material coupled to the anode layer of the second battery cell across the insulating material.

14. The method as defined in claim 13 further comprising brushing away the conductive material from the end of the multiple battery cell until portions of the conductive material coupled to the cathode layer of the first battery cell are electrically isolated from portions of the conductive material coupled to the cathode layer of the second battery cell across the insulating material.

15. The method as defined in claim 12 wherein winding the first and second battery cells further comprises winding one of the first and second battery cells to have a greater amperage capacity.

16. The method as defined in claim 12 further comprising:

extending a portion of the anode layer of the first battery cell beyond the electrolyte layer of the first battery cell in the second axial direction, the portion of the anode layer beyond the electrolyte layer electrically isolated from the electrolyte layer;

extending a portion of the cathode layer of the first battery cell beyond the electrolyte layer of the first battery cell in the first axial direction, the portion of the cathode layer beyond the electrolyte layer electrically isolated from the electrolyte layer;

extending a portion of the anode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the second axial direction, the portion of the anode layer beyond the electrolyte layer electrically isolated from the electrolyte layer; and

extending a portion of the cathode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the first axial direction, the portion of the cathode layer beyond the electrolyte layer electrically isolated from the electrolyte layer.

17. The method as defined in claim 12 further comprising:

refraining from extending the anode layer of the first battery cell beyond the electrolyte layer of the first battery cell in the second axial direction;

refraining from extending the cathode layer of the first battery cell beyond the electrolyte layer of the first battery cell in the first axial direction;

refraining from extending the anode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the second axial direction; and

refraining from extending the cathode layer of the second battery cell beyond the electrolyte layer of the second battery cell in the first axial direction.

18. The method as defined in claim 1 wherein winding the first and second battery cells further comprises winding the first and second battery cells where at least one the first and second battery cells comprises a solid polymer electrolyte.

19. The method as defined in claim 1 wherein winding the first and second battery cells further comprises winding the first and second battery cells where at least one of the cells comprises a viscous electrolyte.

20. The method as defined in claim 19 further comprising injecting the viscous electrolyte after the winding steps.

21. The method as defined in claim 1 further comprising winding a third battery cell a plurality of turns around the second battery cell.

22. The method as defined in claim 21 further comprising coupling the first, second and third battery cells in series.

23. The method as defined in claim 21 further comprising coupling the first, second and third battery cells in parallel.

24. The method as defined in claim 21 further comprising couple two of the first, second and third battery cells in parallel.

25. A structure of a multiple cell battery comprising:

a first battery cell having a plurality of turns producing a first voltage; and

a second battery cell having a plurality of turns wound around the first battery cell, the second battery cell producing a second voltage.

26. The structure of a multiple cell battery as defined in claim 25 wherein the first battery cell further comprises:

an anode layer;

a cathode layer; and

an electrolyte layer disposed between the anode and cathode layer, the electrolyte layer coupling the anode layer and cathode layer.

27. The structure of a multiple cell battery as defined in claim 26 wherein the first battery further comprises:

said anode layer comprising lithium metal;

said cathode layer comprising suitable oxide based coating; and

said electrolyte layer comprising a solid polymer electrolyte.

28. The structure of a multiple cell battery as defined in claim 27 wherein the first battery cell further comprises:

a double sided cathode layer;

a double sided anode layer;

a first electrolyte layer disposed between a first side of the double sided cathode layer and a first side of the double sided anode layer, the first electrolyte layer coupling the double sided cathode layer to the double sided anode layer; and

a second electrolyte layer disposed between a second side of the double sided cathode layer and a second side of the double sided anode layer, the second electrolyte layer also coupling the double sided cathode layer to the double sided anode layer.

29. The structure of a multiple cell battery as defined in claim 26 wherein the second battery further comprises:

an anode layer;

a cathode layer; and

an electrolyte layer disposed between the anode and cathode layer, the electrolyte layer coupling the anode layer and cathode layer.

30. The structure of a multiple cell battery as defined in claim 29 wherein the second battery cell further comprises:

a double sided cathode layer;

a double sided anode layer;

a first electrolyte layer disposed between a first side of the double sided cathode layer and a first side of the double sided anode layer, the first electrolyte layer coupling the first double sided cathode layer to the double sided anode layer; and

a second electrolyte layer disposed between a second side of the double sided cathode layer and a second side of the double sided anode layer, the second electrolyte layer also coupling the double sided cathode layer to the double sided anode layer.

31. The structure of a multiple cell battery as defined in claim 25 further comprising the first and second battery cells coupled in series.

32. The structure of a multiple cell battery as defined in claim 31 further comprising:

an anode layer of the first battery cell exposed for electrical contact on a first end;

a cathode layer of the first battery cell exposed for electrical contact on a second end;

a layer of insulation wound at least one full turn disposed between the first battery cell and the second battery cell;

an anode layer of the second battery cell exposed for electrical contact on the second end;

a cathode layer of the second battery cell exposed for electrical contact on the first end;

a first set of conductive material on the second end electrically contacting the cathode layer of the first battery cell an the anode layer of the second battery cell; and

a second set of conductive material on the first end, a portion of the second set of conductive material coupled to the anode layer of the first battery cell and electrically isolated from a portion of the second set of conductive coating coupled to the cathode layer of the second battery cell.

33. The structure of a multiple cell battery as defined in claim 32 further comprising:

a first set of dielectric lanes defining a portion of the anode layer of the first battery cell exposed for electrical contact on the second end;

a second set of dielectric lanes defining a portion of the cathode layer of the first battery cell exposed for electrical contact on the first end;

a third set of dielectric lanes defining a portion of the anode layer of the second battery cell exposed for electrical contact on the first end; and

a fourth set of dielectric lanes defining a portion of the cathode layer of the second battery cell exposed for electrical contact on the second end.

34. The structure of a multiple cell battery as defined in claim 33 wherein the first set of conductive material on the second end electrically contacts the cathode layer and the portion of the anode layer of the first battery cell, and also electrically contacts the anode layer and the portion of the cathode layer of the second battery cell.

35. The structure of a multiple cell battery as defined in claim 33 wherein the portion of the second set of conductive material coupled to the anode layer of the first battery cell also couples to the portion of the cathode layer of the first battery cell, and wherein the portion of the second set of conductive material coupled to the cathode layer of the second battery cell also couples to the portion of the anode layer of the second battery cell.

36. The structure of a multiple cell battery as defined in claim 25 further comprising the first and second battery cells coupled in parallel.

37. The structure of a multiple cell battery as defined in claim 36 further comprising:

an anode layer of the first battery cell exposed for electrical contact on a first end;

a cathode layer of the first battery cell exposed for electrical contact on a second end;

a layer of insulation wound at least one full turn disposed between the first battery cell and the second battery cell;

an anode layer of the second battery cell exposed for electrical contact on the first end;

a cathode layer of the second battery cell exposed for electrical contact on the second end;

a first set of conductive material on the first end, a portion of the first set of conductive material coupled to the anode layer of the first battery cell and electrically isolated from a portion of the first set of conductive coating coupled to the anode layer of the second battery cell by the layer of insulation; and

a second set of conductive material on the second end, a portion of the second set of conductive material coupled to the cathode layer of the first battery cell and electrically isolated from a portion of the second set of conductive coating coupled to the cathode layer of the second battery cell by the layer of insulation.

38. The structure of a multiple cell battery as defined in claim 37 further comprising:

a first set of dielectric lanes defining a portion of the anode layer of the first battery cell exposed for electrical contact on the second end;

a second set of dielectric lanes defining a portion of the cathode layer of the first battery cell exposed for electrical contact on the first end;

a third set of dielectric lanes defining a portion of the anode layer of the second battery cell exposed for electrical contact on the second end; and

a fourth set of dielectric lanes defining a portion of the cathode layer of the second battery cell exposed for electrical contact on the first end.

39. The structure of a multiple cell battery as defined in claim 38 wherein the portion of the first set of conductive material coupled to the anode layer of the first battery cell also couples to the portion of the cathode layer of the first battery cell, and wherein the portion of the first set of conductive material coupled to the anode layer of the second battery cell also couples to the portion of the cathode layer of the second battery cell.

40. The structure of a multiple cell battery as defined in claim 38 wherein the portion of the second set of conductive material coupled to the cathode layer of the first battery cell also couples to the portion of the anode layer of the first battery cell, and wherein the portion of the second set of conductive material coupled to the cathode layer of the second battery cell also couples to the portion of the anode layer of the second battery cell.

41. The structure of a multiple cell battery as defined in claim 25 further comprising third battery cell having a plurality of turns wound around the second battery cell, the third battery cell producing a third voltage.

42. A structure of a multiple cell battery comprising:

a first battery cell comprising a plurality of substantially rectangular layers rolled to form a cylinder having an axis; and

a second battery cell comprising a plurality of substantially rectangular layers rolled coaxially around the first battery cell.

43. The structure of a multiple cell battery as defined in claim 42 wherein the first battery cell and the second battery cell are coupled in series.

44. The structure of a multiple cell battery as defined in claim 43 further comprising:

an anode layer of the first battery cell extending beyond an electrolyte layer of the first battery cell in a first axial direction;

a cathode layer of the first battery cell extending beyond the electrolyte layer of the first battery cell in a second axial direction;

an anode layer of the second battery cell extending beyond an electrolyte layer of the second battery cell in the second axial direction; and

a cathode layer of the second battery cell extending beyond the electrolyte layer of the second battery cell in the first axial direction.

45. The structure of a multiple cell battery as defined in claim 44 further comprising said cathode layer of the first battery cell electrically coupled to the anode layer of the second battery cell.

46. The structure of a multiple cell battery as defined in claim 44 further comprising:

a substantially rectangular shaped insulating layer rolled at least one wrap wound between the first and second battery cells, said insulating layer extending beyond the anode layer of the first battery cell in the first axial direction, and also extending beyond the anode layer of the second battery cell in the second axial direction;

a conductive material at least partially coating axial ends of the multiple cell battery, a portion of the coating on an end in the first axial direction coupled to the anode of the first battery cell and electrically isolated from a portion of the coating coupled to the cathode of the second battery cell.

47. The structure of a multiple cell battery as defined in claim 46 wherein the conductive material further comprises a conductive shooping material.

48. The structure of a multiple cell battery as defined in claim 42 further comprising:

an anode layer of the first battery cell extending beyond an electrolyte layer of the first battery cell in a first axial direction;

a cathode layer of the first battery cell extending beyond the electrolyte layer of the first battery cell in a second axial direction;

an anode layer of the second battery cell extending beyond an electrolyte layer of the second battery cell in the first axial direction; and

a cathode layer of the second battery cell extending beyond the electrolyte layer of the second battery cell in the second axial direction.

49. The structure of a multiple cell battery as defined in claim 48 further comprising:

a first terminal of the first battery cell coupled to the plurality of turns of the anode layer of the first battery cell;

a second terminal of the first battery cell coupled to the plurality of turns of the cathode layer of the first battery cell;

a first terminal of the second battery cell coupled to the plurality of turns of the anode layer of the second battery cell; and

a second terminal of the second battery cell coupled to the plurality of turns of the cathode layer of the second battery cell.

50. The structure of a multiple cell battery as defined in claim 49 further comprising:

a substantially rectangular shaped insulating layer rolled at least one wrap between the first and second battery cells, said insulating layer extending beyond the anode layers of the first and second battery cells in the first axial direction, and also extending beyond the cathode layers of the first and second battery cells in the second axial direction;

a conductive material at least partially coating axial ends of the multiple cell battery, a portion of the coating on an end in the first axial direction coupled to the anode of the first battery cell and electrically isolated from a portion of the coating coupled to the anode of the second battery cell by the insulating layer, and a portion of the coating on an end in the second axial direction coupled to the cathode of the first battery cell and electrically isolated from a portion of the coating coupled to the cathode of the second battery cell by the insulating layer.

51. The structure of a multiple cell battery as defined in claim 42 wherein at least one of the first and second battery cells further comprises a solid polymer electrolyte.

52. The structure of a multiple cell battery as defined in claim 51 wherein both the first and second battery cells comprises a solid polymer electrolyte.

53. The structure of a multiple cell battery as defined in claim 42 wherein one of the first and second battery cells further comprises a viscous electrolyte.

54. The structure of an integral battery system comprising:

a first device having a plurality of wound turns; and

a second device, independent from the first device, having a plurality of turns wound around the first device.

55. The structure of an integral battery system as defined in claim 54 wherein one of the first and second devices is a battery cell.

56. The structure of an integral battery system as defined in claim 55 wherein the battery cell is a lithium battery cell having a solid polymer electrolyte.

57. The structure of an integral battery system as defined in claim 55 wherein the battery cell has a viscous electrolyte.

58. The structure of an integral battery system as defined in claim 55 wherein one of the first and second devices is a capacitor.

59. The structure of an integral battery system as defined in claim 54 wherein one of the first and second devices is a fuel cell.

60. The structure of an integral battery system as defined in claim 59 wherein one of the first and second devices is a capacitor.

61. In a system with a battery cell having an amperage capacity based on a length of the battery cell, a method of adjusting the amperage of the battery cell comprising removing a portion of the battery cell such that a remaining portion of the battery cell has the desired amperage capacity.

62. The method of adjusting the amperage capacity of the battery cell as defined in claim 61 wherein removing a portion of the battery cell further comprises cutting the battery cell to have a shorter length.

63. The method of adjusting the amperage capacity of the battery cell as defined in claim 62 wherein cutting the battery cell further comprises laser cutting.

64. The method of adjusting the amperage capacity of the battery cell as defined in claim 62 wherein cutting the battery cell further comprises electrode arcing.

65. A method comprising:

wrapping a plurality of turns of a battery cell to make a wound battery cell;

cutting the wound battery cell to create a stacked battery cell, the amperage capacity of the stacked battery cell based on a length of the stacked battery cell; and

removing a portion of the length of the stacked battery cell to adjust the amperage capacity of the stacked battery cell.

66. The method as defined in claim 65 wherein wrapping a plurality of turns of the battery cell to make the wound battery cell further comprises wrapping the plurality of turns of the battery cell around a substantially cylindrical mandrel thus creating a substantially cylindrical shaped wound battery cell.

67. The method as defined in claim 66 wherein wrapping the plurality of turns of the first battery cell around a cylindrical mandrel further comprises wrapping the plurality of turns of the first battery cell around a mandrel having a diameter of at least two feet.

68. The method as defined in claim 67 wherein wrapping the plurality of turns of the battery cell around a mandrel having a diameter of at least two feet further comprises wrapping a plurality of turns of the first battery cell around the mandrel having a diameter of at least two feet and less than five feet.

69. The method as defined in claim 68 wherein wrapping the plurality of turns of the battery cell around the mandrel having a diameter of at least two feet and less than five feet further

comprises wrapping the battery cell around the mandrel having a diameter of approximately three feet.

70. The method as defined in claim 66 wherein cutting the wound battery cell to create a stacked battery cell further comprises:

cutting the substantially cylindrical shaped wound battery cell on one side substantially parallel with an axis of the cylindrical shape; and

laying the cut substantially cylindrical shaped wound battery to be substantially flat to become the stacked battery cell with a circumference of the cylindrical shape becoming the length of the stacked battery cell.

71. In a stacked battery system with a first battery cell having an amperage capacity based on a length of the first battery cell, and a second battery cell having an amperage capacity based on a length of the second battery cell, a method of adjusting the amperage capacity of the first and second battery cells comprising removing a portion of the length of the first and second battery cells such that a remaining portion of each of the first and second battery cells has the desired amperage capacity.

72. The method of adjusting the amperage capacity of the first and second battery cells as defined in claim 71 wherein removing a portion of the length of the first and second battery cells further comprises cutting the stacked battery system to have a shorter length.

73. The method of adjusting the amperage capacity of the first and second battery cells as defined in claim 72 wherein cutting the battery cell further comprises laser cutting.

74. The method of adjusting the amperage capacity of the first and second battery cells as defined in claim 72 wherein cutting the battery cell further comprises electrode arcing.

75. A method comprising:

wrapping a plurality of turns of a first battery cell;

wrapping a plurality of turns of a second battery cell around the first battery cell to make a consecutively wound battery system;

cutting the consecutively wound battery system to create a stacked battery system, the amperage capacity of each cell of the stacked battery system based on a length of the stacked battery system; and

removing a portion of the length of the stacked battery system to adjust the amperage capacity each cell of the stacked battery system.

76. The method as defined in claim 75 wherein the wrapping steps further comprise:

wrapping the plurality of turns of the first battery cell around a substantially cylindrical mandrel; and

wrapping the plurality of turns of the second battery cell around the first battery cell, thus creating a substantially cylindrical shaped wound battery system.

77. The method as defined in claim 76 wherein wrapping the plurality of turns of the first battery cell around a substantially cylindrical mandrel further comprises wrapping the plurality of turns of the first battery cell around a mandrel having a diameter of at least two feet.

78. The method as defined in claim 77 wherein wrapping the plurality of turns of the first battery cell around a mandrel having a diameter of at least two feet further comprises wrapping a plurality of turns of the first battery cell around the mandrel having a diameter of at least two feet and less than five feet.

79. The method as defined in claim 78 wherein wrapping the plurality of turns of the first battery cell around the mandrel having a diameter of at least two feet and less than five feet further comprises wrapping the battery cell around the mandrel having a diameter of approximately three feet.

80. The method as defined in claim 75 wherein cutting the wound battery system to create a stacked battery system further comprises:

cutting the substantially cylindrical shaped consecutively wound battery system on one side substantially parallel with an axis of the cylindrical shape; and

laying the cut substantially cylindrical shaped consecutively wound battery system to be substantially flat to become the stacked battery system with a circumference of the cylindrical shape becoming the length of the stacked battery cell.

81 A method of producing multiple battery ropes, each rope having multiple cells, the method comprising:

winding a first set of battery cells around a mandrel, the first set of battery cells being a first battery cell in each battery rope;

cutting the first set of battery cells between them during the winding step;

winding a second set of battery cells around the first set of battery cells, the second set of battery cells being a second battery in each battery rope;

cutting the second set of battery cells between them during the winding step;

cutting the battery ropes to lay substantially flat and have a substantially rectangular shape;

separating a first battery rope, the first battery rope having multiple battery cells, from the second battery rope, the second battery rope having multiple battery cells.

82. The method of producing multiple battery ropes as defined in claim 81 further comprising cutting one of the first and second battery ropes to have a shorter length to adjust the amperage capacity.

83. The method of producing multiple battery ropes as defined in claim 81 wherein cutting the first set of battery cells between them during the winding step further comprises pulling anode and cathode material of the first set of battery cells over a razor during the winding process.

84. The method of producing multiple battery ropes as defined in claim 83 further comprising, during the winding a first set of battery cells around a mandrel, winding a plurality of electrolyte

layers between the anode and cathode material, the electrolyte layers centered between dielectric lanes in the anode and cathode material defining the first and second battery ropes.

85. The method of producing multiple battery ropes as defined in claim 81 wherein cutting the second set of battery cells between them during the winding step further comprises pulling anode and cathode material of the second set of battery cells over a razor during the winding process.

86. The method of producing multiple battery ropes as defined in claim 85 further comprising, during the winding a first set of battery cells around a mandrel, winding a plurality of electrolyte layers between the anode and cathode material, the electrolyte layers centered between dielectric lanes in the anode and cathode material defining the first and second battery ropes.

87. The method of producing multiple battery ropes as defined in claim 81 further comprising, after the separating step, shooping ends of the battery ropes.